CLAIMS

What is claimed is:

1. A turbine engine comprising:

a plurality of disks, each disk extending radially from an inner aperture to an outer periphery;

a plurality of spacers, each spacer between an adjacent pair of said disks; and

a central shaft carrying the plurality of disks and the plurality of spacers to rotate about an axis with the plurality of disks and the plurality of spacers,

wherein:

said spacers include one or more first spacers having a longitudinal cross-section, said longitudinal cross-section having a first portion being essentially outwardly concave in a static condition.

2. The engine of claim 1 wherein:

said first portion has a longitudinal span of at least 2.0cm.

3. The engine of claim 1 wherein:

at least one of said first spacers is essentially unitarily formed with at least a first disk of said adjacent pair of said disks.

4. The engine of claim 1 wherein:

at least one of said first spacers has an end portion essentially interference fit within a portion of a first disk of said adjacent pair of said disks.

5. The engine of claim 1 wherein:

there are no off-center tie members holding the plurality of disks and the plurality of spacers under compression.

6. The engine of claim 1 wherein:

said longitudinal cross-section first portion is essentially outwardly concave in a running condition of a speed of at least 5000rpm.

7. The engine of claim 1 wherein:

the shaft is a high speed shaft; and

the plurality of disks are high speed compressor section disks.

8. A gas turbine engine disk spacer comprising:

a first end portion either integrally formed with a first disk or having a surface for engaging the first disk;

a second end portion either integrally formed with a second disk or having a surface for engaging the second disk; and

an essentially annular intermediate portion having a concave outward longitudinal sectional median, said longitudinal sectional median measured without reference to any seal teeth, the spacer lacking a radially inwardly extending structural bore.

9. The spacer of claim 8 wherein:

said intermediate portion has a longitudinal span of at least 2.0cm.

10. The spacer of claim 8 wherein:

the first and second end portions and the intermediate portion are unitarily-formed of a metallic material; and

the spacer further includes at least one radially outwardly extending seal tooth.

11. The spacer of claim 8 in combination with said first and second disks and wherein:

the spacer first end portion is unitarily formed with the first disk; and

the spacer second end portion is interference fit within a collar portion of said second disk.

12. A turbine engine comprising:

a central shaft; and

a rotor carried by the central shaft and comprising:

a plurality of disks, each disk extending radially from an inner aperture to an outer periphery; and

means coupling the plurality of disks, the means providing an increase in a longitudinal compression force across the rotor from a first force at a static condition to a second force at a running condition.

13. The engine of claim 12 wherein:

said running condition is characterized by a speed in excess of 5000rpm; and

said compression force essentially increases with speed continuously between said first force and said second force.

14. The engine of claim 12 wherein:

said first force is 50-200kN.

15. The engine of claim 12 wherein:

said means comprises an annular spacer portion having a longitudinal cross-section that:

in said static condition is outwardly concave with a characteristic concavity having a first value; and

in said running condition is outwardly concave with said characteristic concavity having a second value less than the first value.

16. The engine of claim 15 wherein:

the means includes at least three such annular spacer potions.

17. The engine of claim 12 wherein:

there are no off-center tie members holding the plurality of disks and the plurality of spacers under compression.

18. For a gas turbine engine comprising:

a rotor stack comprising:

a plurality of disks, each disk extending radially from an inner aperture to an outer blade-engaging periphery; and

a plurality of spacers, each spacer between an adjacent pair of said disks; and

a central shaft carrying the rotor stack and having a tie portion within the rotor stack,

a method for engineering the engine comprising:

for at least a first condition characterized by a first speed, determining a first longitudinal compression force across the rotor stack;

for at least a second condition characterized by a second speed, determining a second longitudinal compression force across the rotor stack; and

modifying at least one of the plurality of spacers so that the second longitudinal compression force exceeds the first longitudinal compression force by a target amount.

19. The method of claim 18 performed as a simulation.

20. The method of claim 18 wherein the first speed is zero.

21. The method of claim 18 performed as a reengineering of an engine configuration from an initial configuration to a reengineered configuration wherein:

the first longitudinal compression force of the reengineered configuration is less than the first longitudinal compression force of the initial configuration; and

the second longitudinal compression force of the reengineered configuration is at least as great as the second longitudinal compression force of the initial configuration.